The Maryland Fruit Grower

April, 1936

Maryland State
Horticultural Society

BULLETINS YOU MAY LIKE

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Maryland University of Maryland, College Park.
- Roadside Markets in Maryland. Sta. Bull. 365, 1934.
- Studies on Firmness and Keeping Quality of Certain Fruits. Sta. Bull. 366. 1934.
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ABOUT STRAWBERRIES

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Month Runners Were Rooted	*No. of Runner Plants*	*Av. Yield of Runner Plants Next Season*
June	162	14 quarts
July	1989	6 "
August	3884	4 "
Sept.Oct. 15	1127	1 "
Oct. 15-Nov.	3375	1 "

In Maryland, rows about 2½ feet apart, with plants set 3 feet apart, and the plants allowed to root 6 inches apart, keeping the rows narrowed to about 12 to 15 inches, has given fine results, both in yield and quality. Last season, a mixed planting of Dorsett, Blakemore and Fairfax grown under the above conditions showed an average yield of 9664 quarts per acre. This field was mulched with crimson clover hay.

MOUSE AND RABBIT CONTROL

Cornell Extension Bulletin 338, entitled "Field Mouse and Rabbit Control" published by Cornell University Extension Service, Ithica, New York, should be of interest to growers who have had trouble with these pests.

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Recently somebody figured that a 4000 quart per acre strawberry crop required 6 tons of water for the berries alone.

A 2-inch rainfall gives about 57000 gallons per acre.

HAVE YOU PAID YOUR 1936 DUES?

The Maryland Fruit Grower

Published Monthly by the Maryland State Horticultural Society

Edited by the Secretary, A. F. Vierheller, Extension Horticulturist

Vol. 6 **April, 1936** **No. 4**

FRUIT AND FOLIAGE INJURY

S. W. Wentworth
Horticultural Department, University of Maryland

This season will find many fruit growers earnestly trying to reduce fruit and foliage injury by giving more careful consideration to the selection of spray materials, the conditions under which they are applied and the technique of applying them. Fruit growers are getting more conscious of the "complexion" of their fruit, realizing that a high finish or bright "complexion" not only increases the sale value and storage life of fruit but also signifies a healthy condition of the leaves and trees which represents future fruiting capacity. For these reasons, it seems appropriate that we summarize our knowledge and opinions regarding spray injury of fruit and foliage.

An ideal spray would be one which effectively exterminates the insects or diseases without injury to the tree or fruit. It is difficult to find the ideal spray because any concentration of materials which is strong enough to exterminate the undesirable living insect or disease is also apt to cause some injury to the living tree. A spray may be entirely safe and effective at one temperature and yet cause considerable spray injury at a higher or lower temperature. Relative humidity, because of its effect on rate of drying is also an important factor influencing spray injury. Unfortunately, the ideal sprays have not been developed, but considerable knowledge has been gained which is helpful in charting a spray program at the beginning of the season, and in changing and "juggling" the program to fit changing conditions as the season advances. The successful "juggling" of the program to reduce spray injury and to fit changing conditions such as temperature, rainfall, humidity, tenderness of tree and foliage, population of insects or severity of disease infection, is an accomplishment of which every fruit grower should be proud.

Weather Injury

Early in the season we may get considerable injury to foliage and fruit which cannot be attributed to spray materials. Frost or unfavorable weather just previous, during or immediately following the bloom period may result in the familiar "frost bands", longitudinal "tear streaks" of russet or even in the thinly spread "veining" or netted form of russeting on apple fruits. Some forms of weather russeting are almost identical with russeting or spray injury caused by Bordeaux and lime sulphur sprays.

Injury from Tar Oil, Petroleum Oil and Cresylic Acid

Several effective methods for the control of San Jose scale, aphids and red mite have been recommended to us by the entomologists. These insects are most easily killed as they approach their most tender or vulnerable stages of development. As these vulnerable stages in the developmnt of the insects are approached the tree itself is also approaching a more tender condition. In many cases it is best to hold the "fire" of the spray gun until the enemy is in a tender vulnerable position but to "shoot" before the trees themselves are

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injured. How long we can hold that "fire" depends on the material that we are using and the time required to cover the orchard.

One option which the fruit grower has is to use a combination of tar distillate emulsion and petroleum oil. Tar distillate 2½%, in the diluted spray is excellent for the control of rosy aphids but ineffective in the control of scale or red mite. Petroleum oil 3%, in the diluted spray is very effective in the control of scale and red mite but ineffective as a control for aphids. These two materials can be combined in a single spray emulsion containing 2½% tar distillate oil and 3% lubricating oil in the diluted spray. When this is done, scale, aphis and red mite can be controlled in one dormant spray application. It should be clearly understood that any spray that contains tar distillate oil emulsion must be applied when the trees are strictly dormant. If applied after the tips of the buds show gray, considerable burning of the leaf tips will result. On trees that have been weakened by winter injury or other causes considerable damage may result even at the strictly dormant period. According to Hartzell "tar oils and lubricating oils can be used with comparative safety, if the total oil content of the spray does not exceed 5%. It is also believed that they can be used on moderately weakened trees without causing serious injury, provided the total oil content does not exceed 2½%."

If petroleum oil is used alone at the same rate of 3% in the diluted spray it can be applied during the green tip stage without visible injury to the developing leaves. If delayed until this stage, the scale and red mite are in a tender condition and good control is obtained. Petroleum oil used alone, however, will not control aphids.

Another effective and economical spray for the control of aphids, scale and red mite consists of petroleum oil emulsion, 3% oil in the diluted spray, and cresylic acid ½ gal. per 100 gal. of spray. This combination is safe and most effective when applied at the delayed dormant stage of bud development. The one bad feature regarding this spray is the short period available for its application. If applied when the trees are strictly dormant, its effectiveness in the control of aphids is decreased. If applied after the leaf tips of the blossoming spurs are ¼ inch long very severe burning of the spur leaves results. To be effective as an insecticide and not destructive to the foliage it must be applied after the tips of the buds have begun to show gray and before the leaf tips are ¼ inch long. Trees which have been weakened by winter injury or other causes are more subject to this type of spray injury.

Injury from Liquid Lime Sulphur and Wettable Sulphur Sprays

Most fruit growers have experienced the several visible types of spray injury resulting from lime sulphur alone or in combination with other materials. Lime sulphur is a chemical union of sulphur and calcium in a true solution form. While it remains in solution it is chemically active. Especially when humidity and temperature are high, considerable spray injury may result when this solution remains in contact with tender fruit and foliage. High humidity delays drying of the solution and high temperature accelerates the chemical activity or burning. If quick drying occurs, the solution rapidly breaks down into lime and the element sulphur in a fine state of division. Although lime sulphur solution is a most excellent fungicide it is apt to cause spray injury, when the spray dries slowly because of high humidity. After lime sulphur has dried the finely divided sulphur protects the foliage from

scab infection. According to Wilcoxon and McCallan the scab sport in germinating secretes a substance which dissolves the leaf and fruit cuticle. This secretion also reacts with sulphur to form hydrogen sulphide, an extremely poisonous gas which kills the spore. Thus the spore commits suicide. At high temperatures the element sulphur changes into the vapor phase and in this condition it is very toxic to spores and also may cause burning of the tender foliage and russeting of the fruits. This type of injury may occur with sulphur applied in any form when the temperature rises to above 85° F. Liquid lime sulphur may be used to burn out scab lesions which have already become established on foliage. When this is done there is also considerable burning of the foliage. This burning injury to the foliage and fruit may offset the advantage gained by "burning out" the fungus.

In addition to the visible form of injury caused by lime sulphur there may be considerable invisible injury. Heinicke and Hoffman at the Cornell Station have shown that lime sulphur especially when sprayed on the under sides of the leaves reduces the rate of food manufacture. It is believed that this reduction in photosynthetic capacity of the leaves may result in a reduction of fruit size and color, and in fruit bud formation and size of crop for the following year. Because of this reduction in the photosynthetic capacity of the leaves and because of the greater tendency of lime sulphur to cause injury during hot or humid periods, many growers are substituting wettable sulphur especially in the after bloom sprays. There are numerous wettable sulphurs on the market sold under a variety of trade names. In each case the active agent is finely divided sulphur made miscible with water with some

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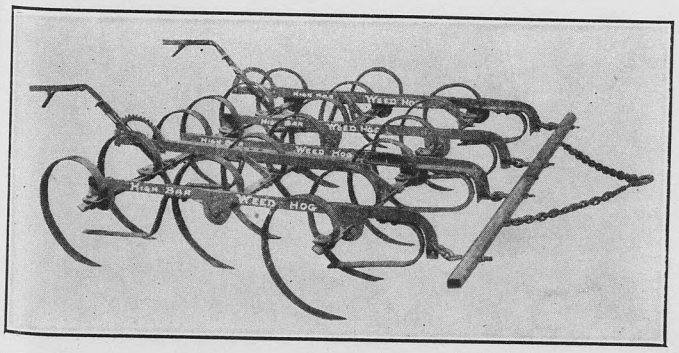

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wetting agent. It is generally agreed that wettable sulphurs will control scab effectively if applied before the spore infection. The toxicity to spores and adherences of the spray increases with the fineness of the sulphur. The substitution of wettable sulphur for lime sulphur, especially in after bloom spray, tends to reduce sulphur injury and causes a better finish on fruit. However when the temperature gets in the upper nineties, as it does in Maryland, there may be some leaf injury and russeting even from wettable sulphur.

Arsenical Injury

A typical injury associated with an excess of water soluble arsenic in the spray consists first of purple spots on the leaves or irregular burned areas near the leaf tips, similar to lime sulphur injury. Later the leaves may yellow and drop off. In the case of susceptible apple varieties such as Wealthy, Jonathan, Winter Banana and Rome the area around the calyx is often burned giving rise to the terms "calyx injury" and "blossom-end injury". With peaches, an excess of soluble arsenic in the spray causes leaf scotching, defoliation, the formation of twig cankers and occasionally burning of the fruit.

When dilute lime sulphur and arsenate of lead are mixed, water soluble arsenic is formed. If high calcium hydrated lime ($Ca(OH)_2$ is added to the dilute lime sulphur before the arsenate of lead is added the reaction which forms soluble arsenic is delayed or inhibited. If calcium carbonate ($Ca\ CO_3$) is added in place of the calcium hydroxide ($Ca(OH)_2$) the amount of water soluble arsenic is increased. The calcium hydroxide gradually changes to the carbonated form after it is sprayed on the trees and therefore water soluble arsenic is formed as the spray weathers. According to Kadow, Young and other workers, this change is greatly reduced by the addition of zinc sulphate to the mixture. The presence of zinc sulphate seems to prevent rapid carbonation of the hydrated lime and probably precipitates the injurious water soluble arsenic in the form of an insoluble zinc arsenate.

The addition of zinc sulphate has apparently given good results in the case of peaches but with apples the results are questionable. Some workers have reported severe russeting of the fruit where zinc sulphate was used in apple sprays. Apparently the best known method of guarding against arsenic injury on apples is the addition of extra amounts of high calcium, low magnesium hydrated lime.

(To be Continued Next Month)

NITROGEN FERTILIZERS

According to S. B. Frost, writing in "Canadian Horticulture", March, 1936, the use of one ton of nitrate of soda (16% nitrogen) gives an alkaline reaction equal to about 583 lbs. of lime; a ton of sulfate of ammonia (20% nitrogen) would require about 2200 lbs. of lime to neutralize its effect of acidity; calcium cyanamide (21% nitrogen) carries the equivalent of approximately 1400 lbs. of lime per ton. These facts are given to remind the grower that the use of various nitrogen fertilizers calls for thought in keeping soil reaction in such condition that trees and cover crops will thrive. This may call for lime and also phosphorus or potash fertilizer depending upon soil conditions.

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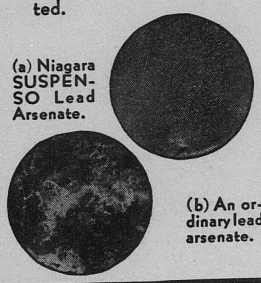


(a) Niagara SUSPENSO Lead Arsenate.

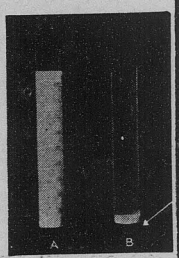
(b) An ordinary lead arsenate.

2 POSITIVE UNIFORM SUSPENSION

● The illustrations hold the proof. Both mixed with common tap water and allowed to stand 24 hours.

(a) Niagara SUSPENSO Lead Arsenate.

(b) An ordinary lead arsenate.

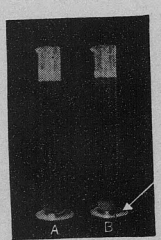


3 NO BLACK SLUDGE With LIME SULPHUR

● Both mixed with summer strength lime sulphur solution.

(a) Niagara SUSPENSO Lead Arsenate-note practically total absence of precipitate.

(b) An ordinary lead arsenate. Note heavy precipitate (sludge). Common tap water used in both and allowed to stand 1/2 hour.



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